

REMARKS

This Response, filed in reply to the Office Action dated April 13, 2006, is believed to be fully responsive to each point of rejection raised therein. Accordingly, favorable reconsideration on the merits is respectfully requested.

Claims 1-16 are all the claims pending in the application.

1. Claim Rejections Under 35 U.S.C. § 103

The Examiner has maintained his rejection of claims 1-6, 8-13, 15 and 16 under 35 U.S.C. § 103(a) as being unpatentable over Kano (US 5,359,513) [“Kano”] in view of Jatko (“Nonlinear Filter Derived From Topological Image Features”, SPIE Vol. 1295 Real-Time Image Processing II, 1990)[“Jatko”]. For at least the followings reasons, Applicant respectfully traverses these rejections.

Claim 8 recites an apparatus for detecting suspected anomalous shadows that comprises “an image processing means for obtaining a processed difference image by subjecting said difference image to an image process wherein an actual difference between the two images on which said difference image is based is enhanced relative to artifacts appearing due to misalignment of a position of a structural element of the subject on one of the two images from a corresponding position of the structural element on the other of the two images.” The Examiner’s contentions are the same as that in the Office Action of July 22, 2005, which cites a section of Kano that discloses that post-processing techniques can include computer-aided diagnostics and applies Jatko to allegedly teach the claimed image processing for obtaining a processed difference image. The Examiner contends that one skilled in the art would have

combined the references to remove artifacts that can be misinterpreted as flaws. (Office Action of July 22 at pages 3-4.)

In response to the arguments that the teachings of Jatko would not allow one skilled in the art to administer morphological operations that would eliminate the artifacts produced by the image subtraction process of Kano, the Examiner contends that he does not understand this argument. In addition, the Examiner contends that “Jatko removes small misregistration errors, which are by definition artifacts [and that] Jatko would not correct for large errors (resulting in say a tumor growth between images).” (Present Office Action at page 3.)

Applicant submits that the Examiner’s comments are precisely why Jatko does not provide teachings that would eliminate the artifacts in Kano and why one skilled in the art would not have combined the teachings as suggested by the Examiner.

Jatko discloses that the thresholded imaged $t(x, y)$ has many small artifacts after the attenuation process and the grey-level threshold process has been applied to the difference image $d(x, y)$. (Page 12, last paragraph.) Jatko also discloses that gray-scale erosion and dilation morphological operations are then performed on the thresholded image. *Id.* The Examiner relies on these morphological operations to allegedly teach the claimed image process on the difference image as set forth in claim 8. (Office Action at page 4, “It should be pointed out that examiner pointed to pages 12-14 for the teachings of artifact removal.”)

The morphological operations used by Jatko are as follows:

The particular sequence used is an erosion followed by two passes of dilation and finally another erosion. As the names of the operations imply, the erosion removes one perimeter pixel from the feature and

eliminates point features that are one or two pixels on a side, while
dilation adds a perimeter pixel. **Features smaller than two pixels per
side are eliminated by the first erosion...**

(Jatko at pages 13-14, emphasis added.)

As even the Examiner concedes, the morphological operations used in Jatko only remove small misregistration errors. In fact, as is evident from the above cited description, the morphological operations only remove “artifacts” of one or two pixels.

Jatko relates to a method of processing images where actual differences, i.e. flaws, in printed documents are differentiated from normal variations in the printing process due to ink chemistry, plate wear and environmental conditions, i.e. artifacts due to spatial misalignment. (Jatko at page 8, second full paragraph.) Since these variations would not be substantial, Applicants submit that the artifacts would appear as random fine points as evidenced by Fig. 5d of Jatko.

Accordingly, the morphological operations of Jatko are designed with consideration of the “artifacts” that would be produced by Jatko’s technology, which analyzes printed documents. That is, in Jatko, printed document inspection applications would require the removal of “point flaws,” i.e. artifacts, due to ink topology. There is no disclosure or suggestion in Jatko that its morphological operations would be applicable to the types of “artifacts” found in temporal subtraction images, such as those disclosed in Kano.

Therefore, any morphology operations that may be performed on the subtraction image in Kano would require structural elements that are designed to remove the linear and planar artifacts. In addition, the structural elements need to be designed to differentiate between

“artifacts” and “abnormalities” such as tumors. Contrary to the Examiner’s contentions, the “artifacts” in Kano may not necessarily be small, i.e. one or two pixels, and the “growth of a tumor” may not necessarily be larger than one or two pixels. In fact, Applicant would submit that the linear and planar artifacts would be greater than one or two pixels such that the morphological process in Jatko would be largely inconsequential if combined with Kano.

Accordingly, Applicant submits that merely contending that Jatko removes “artifacts” is not enough. Further, it is submitted that teachings related to the design of structural elements that remove “artifacts” greater than one or two pixels and that differentiate between these “artifacts” and “abnormal regions” are needed. Kano and Jatko (taken alone or in combination) do not provide these teachings. Therefore, one skilled in the art would not have combined the teachings of Kano and Jatko, and the Examiner has failed to make a *prima facie* case of obviousness.

In addition, Kano discloses that Δx and Δy values at locations where there are position alignment errors differ from those in surrounding areas. The Δx and Δy values become either extremely great or extremely small and become singular points. The Δx and Δy values do not become singular points at locations where there are tumors or indications of disease. Kano obtains the values of Δx and Δy at positions on a lattice (Figs. 6A, 6B) and values of shift (Δx and Δy) between the lattice points are obtained by interpolation (Fig. 8A, 8B). Kano discloses that reliable shift values cannot be obtained if the value of the singular point is employed in the interpolation process (col. 9, lines 27-68). Thus, Kano is silent regarding differences between artifacts that appear in subtraction images and images of tumors that appear due to progression of disease. Kano does not teach that artifacts are small, whereas changes due to disease, such as

tumor growth, are large. Therefore, the Examiner's contention that "Jatko removes small misregistration errors, which are by definition artifacts [and that] Jatko would not correct for large errors" cannot be applied to Kano.

Because claim 1 recites features similar to those given above with respect to claim 8, Applicant submits that the Examiner has failed to make a *prima facie* case of obviousness for at least reasons similar to those given above with respect to claim 8.

Applicant submits that claims 2-6, 9-13, 15 and 16 are patentable at least by virtue of their respective dependencies.

In addition, claim 15 recites that the interimage processing comprises global matching between corresponding structural elements within the two images obtained of the same subject ... The Examiner contends that to find the Regions of Interest (ROI) in Kano, global matching is performed in order to find the anatomic structures. (Office Action at page 2.)

Kano discloses that the process of selection of the ROIs in the two digitized images is based on the analysis of the anatomic structures. (Col. 5, lines 24-26.) Applicant submits that the cited section of Kano merely discloses that the ROIs of each image are based on the structures of their respective images. The flow chart in Fig. 1C, which corresponds the process of selecting ROIs, lists, as its first step, "Obtain Digital Image," where "image" is given in the singular. Accordingly, the selection of ROIs within an image is only based on the image itself. There is no disclosure or suggestion in Fig. 1C or elsewhere in Kano that global matching occurs between corresponding structural elements within two images as set forth in claim 15.

Because claim 16 recites a feature similar to that given above with respect to claim 15, claim 16 is patentable for at least reasons similar to those given above with respect to claim 15.

The Examiner has rejected claims 7 and 14 under 35 U.S.C. § 103(a) as being unpatentable over Kano and Jatko as applied to claims 1-4 and 8-11 respectively and further in view of Doi (US 5,289,374) ["Doi"]. For at least the following reasons, the rejection should be withdrawn.

Because Doi does not cure the deficient teachings of Kano and Jatko given above with respect to claims 1 and 8, claims 7 and 14 are patentable at least by virtue of their respective dependencies.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.


Respectfully submitted,

SUGHRUE MION, PLLC
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

WASHINGTON OFFICE

23373

CUSTOMER NUMBER


Susan W. Pao
Registration No. 41,239

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